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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/574,184 | 03/30/2006 | Gary A. Schwartz | US030405 | 7437 |

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PHILIPS INTELLECTUAL PROPERTY & STANDARDS
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| EXAMINER | |
|---|---|
| SANTOS, JOSEPH M | |
| ART UNIT | PAPER NUMBER |
| 3737 | |
| MAIL DATE | DELIVERY MODE |
| 08/06/2010 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/574,184 | SCHWARTZ, GARY A. | |
| | Examiner | Art Unit | |
| | JOSEPH SANTOS | 3737 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *16 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

1. Upon reconsideration by the Examiner and in view of Applicant's arguments the previous grounds of rejection have been withdrawn and the following new grounds of rejection have been set forth.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims **1-9, and 14-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Seyed-Bolorforosh et al (Seyed) (US 5,797,846) in view of Powers et al (US 2002/0045822).Seyed teaches a system and method to sample a volumetric region by obtaining a high frame rate while limiting the spatial aliasing, comprising: a two dimensional array, a beamformer 2, processor 4, and a scan coverter/display 8. In accordance, the ultrasound beam distribution is adjusted according to the scan format and the beam width. The beam width is proportional to the point spread function (which is the product of the F number and the operating wavelength; the F number equals the focal depth divided by the aperture). Seyed teaches a method of changing the focal depth or the aperture width to obtain an optimal minimum number of beams fired. Therefore, modifying the point spread function to satisfy the Nyquist spatial sampling criteria by maintaining the number of beams to the optimal minimum (col. 1 line 60 to col. 2 line 46 and Figs. 3A and 3B). Further, Seyed teaches the beam distribution can be dependent on the apodization or window shading function (col. 4 lines 29-31). It should be noted that in the applicant's specification is disclosed that the point spread function is determined by the size of the transducer aperture employed and the apodization used at the aperture (see pg. 4, 2nd paragraph of applicant's disclosure). In addition, Seyed teaches a scan controller which controls the beam distribution and the beam density (col. 4, lines 6-9). Seyed further teaches that the transducer array can vary each successive firing ray to obtain a steering angle which is significantly different than the steering angle of the previous firing ray (col. 5, lines 47-50), therefore providing for beam overlapping. Seyed further teaches changing the transmitted and/or received beams in the azimuth and longitudinal dimensions (Figs. 3A and 3B), and further varying the beamforming parameter of each of the firings rays to provide a change in the focus position of the ray or otherwise changing the spatial position of the received data for each firing (col. 1, lines 24-34). It would have been obvious to one ordinary skilled in the art to fire two different rays with different

line densities, one density less than the other, and to further overlap these rays using the scan controller and methods teach by Seyed in order to optimize the frame rate versus a desired resolution and spatial aliasing. Further, it would have been obvious to one ordinary skilled in the art that having Seyed scanned a volumetric area in azimuth and longitudinal dimension, the invention of Seyed would efficiently scan a volumetric region in both symmetrical/asymmetrical azimuth and elevation dimensions in order to provide a user desired scanning area. It would have been obvious to one ordinary skilled in the art to further vary the aperture width of the transducer in order to provide a desired point spread function parameter. Seyed discloses using a linear transducer array. Seyed fails to teach using a two-dimensional transducer array to acquire the three-dimensional scanning. In the same field of endeavor Powers discloses a two-dimensional array ultrasonic diagnostic imaging transducer in order to acquire a three-dimensional imaging volume. It would have been obvious to one skilled in the art to have modified Seyed such that a two-dimensional transducer can be used instead of a linear transducer in order to acquire a volumetric region using a desire imaging pattern. Such a modification will further allow for varying the azimuth and elevation dimensions of the beamformer.

4. Claims **10-13 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Seyed-Bolorforosh (5,797,846) in view of Powers et al (US 2002/0045822), as applied to claim 9, and further in view of Ustuner et al. (6,551,246).

Seyed teaches the system as disclosed above but fails to teach the specific use of apodization to provide a required point spread function. Ustuner et al., in the same field of endeavor, teach that apodizations parameter associated with a pair of transmitted rays is selected such that the spatial frequency spectrum, and therefore the point-spread function have an acceptable structure (col. 15, lines 8-11). Ustuner further teach that the beam-width/side-lobe compromise through the angle of the transmit wave and the apodization parameter (col. 3, lines 12-15). It would have been obvious to one ordinary skilled in the art to use the apodization to control the point spread function and therefore providing a effective spatial sampling in order to provide an ultrasound transmitting/receiving mechanism that can improve the point spread function. Finally, it would have been obvious to one ordinary skilled in the art that the apodization parameter will vary based on the beam angle as taught by Ustuner et al.

***Response to Arguments***

Applicant's arguments filed 03/16/2010 have been fully considered but they are not persuasive. With respect to the applicant's argument that Seyed-Bolorforosh does not teach controlling the point spread function of the beam, the Examiner respectfully disagrees. As noted above, Seyed discloses the ultrasound beam distribution is adjusted according to the scan format and the beam width. The beam width is proportional to the point spread function (which is the product of the F number and the operating wavelength; the F number equals the focal depth divided by the aperture). Seyed teaches a method of changing the focal depth or the aperture width to obtain an optimal minimum number of beams fired. Therefore, modifying the point spread function to satisfy the Nyquist spatial sampling criteria by maintaining the number of beams to the optimal minimum (col. 1 line 60 to col. 2 line 46 and Figs. 3A and 3B). Further, Seyed teaches the beam distribution can be dependent on the apodization or window shading function (col. 4 lines 29-31). It should be noted that in the applicant's specification is disclose that the point spread function is determined by the size of the

transducer aperture employed and the apodization used at the aperture (see pg. 4, 2nd paragraph of applicant's disclosure). Seyed teaches controlling both parameters as disclosed above, therefore controlling the point spread function of the beam. With respect to the applicant's argument regarding controlling the aperture function and the line density. Seyed teaches controlling the aperture function as disclosed above. Seyed further teaches a scan controller which controls the beam distribution and the beam density (col. 4, lines 6-9). Therefore, it would have been obvious to one ordinary skilled in the art to further vary the aperture width of the transducer in order to provide a desired point spread function parameter. With respect to claim 3, controlling the aperture function will inherently control for a narrower or broader beam profile. With respect to claim 4, Seyed further teaches that the transducer array can vary each successive firing ray to obtain a steering angle which is significantly different than the steering angle of the previous firing ray (col. 5, lines 47-50), therefore providing for beam overlapping. With respect to claim 5-6 and 14-15 regarding the Nyquist criterion, see rejection above. With respect to claims 7 and 8, in the absence of any showing of criticality, it would have been obvious to one ordinary skilled in the art that having Seyed scanned a volumetric area in azimuth and longitudinal dimension, the invention of Seyed would efficiently scan a volumetric region in both symmetrical/asymmetrical azimuth and elevation dimensions in order to provide a user desired scanning area.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSEPH SANTOS whose telephone number is 571-270-7782. The examiner can normally be reached on Monday through Thursday 7:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, BRIAN CASLER can be reached on 571-272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J.S./
Examiner, Art Unit 3737

/Ruth S. Smith/
Primary Examiner, Art Unit 3737